wherein the reflector is formed of a ceramic having a thermal conductivity of at least about 0.005 (cal/cm·sec·deg) at a temperature of 20°C.

The claimed invention is also, as recited in Claim 7, a projector, comprising an illuminating optical system including the above light source device; an electrooptic device that modulates light emitted from the illuminating optical system in response to image information; and a projection optical system that projects a modulated light obtained by the electrooptic device.

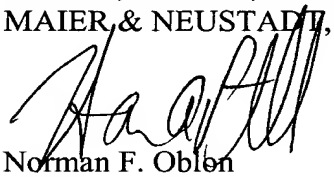
The rejection of Claims 1-13 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,621,267 (Shaffner et al), is respectfully traversed. As shown by the Kyocera data sheet and English translation thereof (3 total pages) **submitted herewith**, alumina can have various thermal conductivities according to its content (%) and appearance. Porous alumina (e.g., No. A-410 or No. A-432) has a thermal conductivity of 0.004 cal/cm·sec·deg at 20°C. Thus, it is **not** inherent that alumina has a thermal conductivity of at least 0.005 cal/cm·sec·deg at 20°C. As the Examiner notes, Shaffner et al discloses a high-power metal halide reflector lamp wherein the lamp contains a ceramic reflector made of alumina, i.e., Al_2O_3. Shaffner et al discloses a cast reflector (column 3, lines 8-10, Fig. 3 and column 3, lines 56-58). The cast reflector has a rough inside surface (column 3, lines 10-15) and is almost completely comprised of alumina. Thus, it is respectfully submitted that this reflector, like above No. A-410, is formed of porous alumina having a relatively small thermal conductivity, i.e., less than 0.005 cal/cm·sec·deg at 20°C. Nor would it have been obvious, without the present disclosure as a guide, to use an alumina in Shaffner et al meeting the presently-recited thermal conductivity limitation.

For all the above reasons, it is respectfully requested that this rejection be withdrawn.

All of the presently-pending claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



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Serial No:
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Amendment Filed on:
HEREWITH

IN THE CLAIMS

--3. (Amended) A light source device in accordance with claim 2, wherein the ceramic is composed of any material selected from the group consisting of Al_2O_3, $2MgO \cdot SiO_2$, $MgO \cdot SiO_2$, $ZrO_2 \cdot SiO_2$, TiO_2 [compounds], SiC, Si_3N_4, ZrO_2, and cermet.

9. (Amended) A projector in accordance with claim 8, wherein the ceramic is composed of any material selected from the group consisting of Al_2O_3, $2MgO \cdot SiO_2$, $MgO \cdot SiO_2$, $ZrO_2 \cdot SiO_2$, TiO_2 [compounds], SiC, Si_3N_4, ZrO_2, and cermet.

Claims 14-31 (New).--

セラミックの特性表 (1)

Appendix 2

項目 ＼ 材質			アルミナ (Al_2O_3)																									単結晶サファイア (Al_2O_3)		
京セラ No.			A-410	A-420	A-430	A-432	A-23 (A-23R)	A-56	A-61	A-150	A-201 (A-201R)	A-440	A-442	A-445		A-459	A-460	A-473	A-476	A-479	A-479SS	A-480	A-482 (A-482R)	A-484	A-486	A-490	A-500	SA-100		
外観			多孔質				ち密質																多孔質	ち密質				ち密質		
呈色			白色	白色	黒色	白色	白色 (あづき色)	白色	黒色	各色	白色 (あづき色)	黒紫色	黒褐色	黒褐色		あづき色	あづき色	白色	白色	白色	白色	象牙色	白色 (ピンク色)	白色	あづき色	白色	白色	透明		
アルミナ含有量 (%)			99.9	—	—	—	99.7	99.7	—	—	98	90	76	91		90	96	92	96	99	99.5	99.8	76	93	96	99.5	98	99.9		
主な特長			多孔質				強度・耐摩耗性大					高周波電気絶縁性優秀・強度大・耐熱性優秀																・機械的強度大 ・耐熱性大 ・耐食性大 ・高周波電気絶縁性優秀 ・光透過性大(透明)		
			・脱ガス容易 ・電気絶縁性優秀	・耐熱性大	・含油性	・耐熱性 ・電気絶縁性優秀	・表面平滑	・高温強度大	・強靭 ・熱伝導良好	・色調光沢 ・透光性良好	・表面平滑	・透光性大 ・メタライズ性良好	・導電性	・透光性大 ・熱放散性良好		・耐熱性大	・耐摩耗性大	・メタライズ性良好 ・強度大	・表面平滑 ・印刷性良好	・硬度大 ・耐食性優秀	・硬度大 ・耐食性大 ・耐摩耗性大	・硬度大 ・耐食性大 ・熱間強度大	・耐熱性大	・耐摩耗性大	・耐熱性大	・表面平滑	・表面平滑			
主な用途			・電子管 ・カソード ・ヒーター ・絶縁管	・耐火用 ・セッター 及び部品	・オイルバーナー ・ローラー	・電子管 ・耐熱部品	・表面	・切削工具	・切削工具 ・耐摩耗部品	・装飾品	・表面	・IOパッケージ ・表示管	・摺動部品	・IOパッケージ ・トランジスターヘッダ ・表示管		・バーナーノズル	・表面	・IO多層パッケージ ・電子管部品 ・耐摩耗部品	・ハイブリッドIC厚膜用基板	・耐熱 ・耐摩耗 ・耐食部品	・耐摩耗 ・耐食部品 ・電算機スライダー	・耐熱 ・耐食部品	・溶接用ノズル ・グラスファイバー用ノズル	・摺動部品 ・キャプスタン	・バーナーノズル	・ハイブリッドIC薄膜用基板	・表面	・SOS基板 ・高温高圧機器用窓材 ・機構部品 ・理化学機器部品 ・ベアリング		
嵩比重		—	2.4	2.9	2.5	2.4	3.9	3.9	4.1	4.0	3.8	3.6	3.7	3.9		3.6	3.8	3.6	3.8	3.8	3.8	3.9	3.6	3.6	3.8	3.8	3.7	3.97		
吸水率		%	5~15	5~20	5~15	10~15	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0.6	0	0	0	0	0		
機械的特性	ビッカース硬さ	荷重500g kg/mm²	—	—	—	—	1,750	2,100	2,300	1,800	1,600	1,300	1,000	1,100		1,300	1,600	1,350	1,500	1,650	1,800	1,800	1,000	1,400	1,600	1,600	1,600	2,300		
	曲げ強度	kg/cm²	650	500	700	600	3,500	5,400	7,500	3,200	2,900	2,800	1,800	2,100		2,900	2,600	3,200	2,800	3,100	3,300	3,200	1,600 (2,000)	3,100	3,300	2,800	4,000	7,000		
	圧縮強度	kg/cm²	—	—	—	—	26,000	40,000	45,000	—	—	—	—	—		—	—	23,500	—	22,000	24,000	—	—	—	—	—	25,000	30,000		
	ヤング率	kg/cm² (×10⁶)	—	—	—	—	3.8	3.9	3.8	3.9	3.6	—	—	—		2.6	3.4	2.7	3.2	3.5	3.7	3.8	—	3.0	3.5	—	4.0	4.8		
	ポアソン比	—	—	—	—	—	0.19	—	—	—	0.20	—	—	—		0.30	0.21	0.23	0.23	0.25	0.23	0.19	—	0.25	—	—	—	—		
熱的特性	線膨張係数	40~400℃ 1/℃ (×10⁻⁶)	6.8	6.5	7.0	6.8	6.8	—	—	—	6.8	7.0	7.1	7.2		7.0	6.7	6.9	7.1	7.1	7.1	6.8	6.4 (6.0)	6.8	6.8	6.8	7.0	C軸に平行 25℃	5.3	
		40~800℃	7.5	8.0	8.1	7.7	7.7	7.8	8.0	7.8	7.7	7.8	8.0	8.1		7.8	7.6	7.7	7.8	7.9	7.9	7.8	7.1	7.7	7.7	7.7	7.9	C軸に垂直	4.5	
	熱伝導率	20℃ cal・cm/cm²・sec・℃	0.004	—	—	0.004	0.07	0.07	0.08	0.07	0.06	0.04	—	0.04		0.04	0.06	0.04	0.05	0.06	0.06	0.07	0.02	0.04	0.05	0.06	0.07	0.11		
	比熱	cal/g℃	—	—	—	—	0.19	0.19	0.17	0.19	0.19	0.20	—	0.19		0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.18	0.19	0.19	0.19	0.19	0.18		
	最高使用温度	℃	1,600	1,600	1,000	1,600	1,750	—	—	—	1,650	1,500	1,200	1,200		1,500	1,600	1,500	1,600	1,600	1,600	1,750	1,500	1,500	1,600	—	1,500	2,000 (融点2,050℃)		
電気的特性	絶縁耐力	kV/mm	10	—	—	10	—	—	—	—	—	10	—	10		10	—	10	10	10	—	—	—	—	—	10	—	—		
	体積固有抵抗	20℃ Ω・cm	>10¹⁴	—	—	>10¹⁴	—	—	—	—	—	10¹⁴	10⁹	10¹²		10¹⁴	—	>10¹⁴	>10¹⁴	>10¹⁴	>10¹⁴	>10¹⁴	—	>10¹⁴	—	>10¹⁴	—	10¹⁶		
		300℃	>10¹⁴	—	—	10¹³	—	—	—	—	—	10⁹	—	10⁶		10¹²	—	10¹³	10¹¹	10¹¹	—	—	—	—	—	10¹⁴	—	—		
		500℃	10¹²	—	—	10¹⁰	—	—	—	—	—	10⁷	—	10⁷		10⁹	—	10¹⁰	10⁹	10⁹	—	—	—	—	—	10¹¹	—	—		
	誘電率 (1MHz)	—	5.0	—	—	—	—	—	—	—	—	—	—	—		8.5	—	9.5	—	9.7	10.2	—	—	—	—	9.7	—	(10⁸~10¹⁰Hz 25℃)	C軸に平行 11.5 C軸に垂直 9.3	
	誘電正接 (1MHz)	(×10⁻⁴)	—	—	—	—	—	—	—	—	—	—	—	—		3	—	8	—	2	—	—	—	—	—	2	—	—		
	損失係数	(×10⁻⁴)	—	—	—	—	—	—	—	—	—	—	—	—		25	—	76	—	19	—	—	—	—	—	19	—	—		
耐腐食性	硝酸 (60%) 90℃	mg/cm²/day	—	—	—	—	—	—	—	—	—	—	—	—		—	—	0.32	—	0.10	—	0.08	—	0.14	—	—	—			
	硫酸 (95%) 95℃		—	—	—	—	—	—	—	—	—	—	—	—		—	—	0.65	—	0.33	—	0.32	—	0.34	—	—	—			
	水酸ソーダ (30%) 80℃		—	—	—	—	—	—	—	—	—	—	—	—		—	—	0.91	—	0.26	—	0.20	—	0.95	—	—	—			
光学的性質	屈折率																											No	1.768	
																												Ne	1.760	
	光透過率																											3,000Å~3,500Å に於て80%以上		

Item＼Material				ALMINA (Al2O3)													
KYOCERA No.				A-410	A-420	A-430	A-432	A-23 (A-23R)	A-56	A-61	A-150	A-201 (A-201R)	A-440	A-442	A-445	A-459	A-460	A-473
Appearance				Porous				Dense										
Color				White	White	Black	White	White (Russet)	White	Black	several	White (Russet)	Dark violet	Dark brown	Dark brown	Russet	Russet	White
Alumina Content (%)				99.9	-	-	-	99.7	99.7	-	-	98	90	76	91	90	96	92
Main Characteristics				Porous				high mechanical strength, high wear resistance					high frequency insulation,high mechanical strength, high heat resistance					
				degassing facility, high insulation	high heat resistance	oil impregnation	heat resistance,high insulation	good surface smoothness	high mechanical strength at high temperature	hard, good thermal conductivity	glossy, translucency	good surface smoothness	light intercepting, good metallization	conductive	light intercepting, high heat dissipation	high heat resistance	high wear resistance	good metallization, high mechanical strength
Main Applications				electronic tube cathode, tube, heater insulating tube	setter and component for fireproof	oiling roller	electronic tube heat resisting component	thread guide	cutting tool	cutting tool, wear resistant component	ornament	thread guide	IC package, display tube	slidable component	IC package, transistor header, display tube	burner nozzle	thread guide	IC multi-layer package, electronic tube component, wear resistant component
Bulk Specific Gravity			-	2.4	2.9	2.5	2.4	3.9	3.9	4.1	4.0	3.8	3.6	3.7	3.9	3.6	3.8	3.6
Water Absorption			%	5-15	5-20	5-15	10-15	0	0	0	0	0	0	0	0	0	0	0
Mechanical Characteristic	Vickers Hardness		Kg/mm2 (load 500g)	-	-	-	-	1,750	2,100	2,300	1,800	1,600	1,300	1,000	1,100	1,300	1,600	1,350
	Flexural Strength		Kg/cm2	650	500	700	600	3,500	5,400	7,500	3,200	2,900	2,800	1,800	2,100	2,900	2,600	3,200
	Compressive Strength		Kg/cm2	-	-	-	-	26,000	40,000	45,000	-	-	-	-	-	-	-	23,500
	Young's Modulus		Kg/cm2 (×10^6)	-	-	-	-	3.8	3.9	3.8	3.9	3.6	-	-	-	2.6	3.4	2.7
	Poisson's Ratio		-	-	-	-	-	0.19	-	-	-	0.20	-	-	-	0.30	0.21	0.23
Thermal Characteristic	Coefficient of Linear Thermal Expansion	40-400℃	1/℃	6.8	6.5	7.0	6.8	6.8	-	-	-	6.8	7.0	7.1	7.2	7.0	6.7	6.9
		40-800℃	(×10^-6)	7.5	8.0	8.1	7.7	7.7	7.8	8.0	7.8	7.7	7.8	8.0	8.1	7.8	7.6	7.7
	Thermal Conductivity	20℃	cal·cm/(cm2·sec·℃)	0.004	-	-	0.004	0.07	0.07	0.08	0.07	0.06	0.04	-	0.04	0.04	0.06	0.04
	Specific Heat		cal/(g·℃)	-	-	-	-	0.19	0.19	0.17	0.19	0.19	0.20	-	0.19	0.20	0.19	0.19
	Maximum Working Temperature		℃	1,600	1,600	1,000	1,600	1,750	-	-	-	1,650	1,500	1,200	1,200	1,500	1,600	1,500
Electrical Characteristic	Dielectric Strength		KV/mm	10	-	-	10	-	-	-	-	-	10	-	10	10	-	10
	Volume Resistivity	20℃	Ω·m	>10^14	-	-	>10^14	-	-	-	-	-	10^14	10^8	10^12	10^14	-	>10^14
		300℃		>10^14	-	-	10^13	-	-	-	-	-	10^9	-	10^8	10^12	-	10^13
		500℃		10^12	-	-	10^10	-	-	-	-	-	10^7	-	10^7	10^9	-	10^10
	Dielectric Constant (1MHz)		-	5.0	-	-	-	-	-	-	-	-	-	-	-	8.5	-	9.5
	Dielectric Loss Angle (1MHz)		(×10^-4)	-	-	-	-	-	-	-	-	-	-	-	-	3	-	8
	Loss factor		(×10^-4)	-	-	-	-	-	-	-	-	-	-	-	-	25	-	76
Chemical Characteristic	Nitric Acid (60%) 90℃		mg/cm2/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.32
	Sulfuric Acid (95%) 95℃			-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.65
	Caustic Soda (30%) 80℃			-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.91

									Single Crystal SAPPHIRE		
A-476	A-479	A-479SS	A-480	A-482 (A-482R)	A-484	A-486	A-490	A-500	SA-100		
				Porous	Dense				Dense		
White	White	White	Ivory	White (Pink)	White	Russet	White	White	Transparent		
96	99	99.5	99.8	76	93	96	99.5	98	99.9		
good surface smoothness, good printing	hard, chemically stable	hard, chemically stable, high wear resistance	hard, chemically stable, hot mechanical strength	high heat resistance	high wear resistance	high heat resistance	good surface smoothness	good surface smoothness	high mechanical strength, high heat resistance, chemically stable, high frequency insulation, high translucency (transparent)		
substrate for hybrid IC thick film	heat, wear and corrosion resistant component	wear resistant, corrosion resistant component, computer slider	heat resistant, corrosion resistant component	welding nozzle, nozzle for glass fiber	slidable component, capstan	burner nozzle	substrate for hybrid IC thin film	thread guide	SOS substrate, window for high-temperature and high-pressure device, structure component, physicochemistry device component		
3.8	3.8	3.8	3.9	3.6	3.6	3.8	3.8	3.7	3.97		
0	0	0	0	0.6	0	0	0	0	0		
1,500	1,650	1,800	1,800	1,000	1,400	1,600	1,600	1,600	2,300		
2,800	3,100	3,300	3,200	1,600 (2,000)	3,100	3,300	2,800	4,000	7,000		
-	22,000	24,000	-	-	-	-	-	25,000	30,000		
3.2	3.5	3.7	3.8	-	3.0	3.5	-	4.0	4.8		
0.23	0.25	0.23	0.19	-	0.25	-	-	-	-		
7.1	7.1	7.1	6.8	6.4 (6.0)	6.8	6.8	6.8	7.0	parallel to c axis	25℃	5.3
7.8	7.9	7.9	7.8	7.1	7.7	7.7	7.7	7.9	vertical to c axis		4.5
0.05	0.06	0.06	0.07	0.02	0.04	0.05	0.06	0.07	0.1		
0.19	0.19	0.19	0.19	0.18	0.19	0.19	0.19	0.19	0.18		
1,600	1,600	1,600	1,750	1,500	1,500	1,600	-	1,500	2,000(melting point 2,050℃)		
10	10	-	-	-	-	-	10	-	-		
>10^14	>10^14	>10^14	>10^14	-	>10^14	-	>10^14	-	10^16		
10^11	10^11	-	-	-	-	-	10^14	-	-		
10^9	10^9	-	-	-	-	-	10^11	-	-		
-	9.7	10.2	-	-	-	-	9.7	-	(10^3-10^10Hz 25℃)	parallel to c axis	11.5
										vertical to c axis	9.3
-	2	-	-	-	-	-	2	-	-		
-	19	-	-	-	-	-	19	-	-		
-	0.10	-	0.08	-	0.14	-	-	-	Optical Characteristic	refractive index	No 1.768
-	0.33	-	0.32	-	0.34	-	-	-			Ne 1.760
-	0.26	-	0.20	-	0.95	-	-	-		light transmittance	no less than 80% at 3,000Å-3,500Å